GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[x] ORIGINAL [ ] REVISION NO. _____

Project No. E-22-616 DATE 2/26/82

Project Director: Nelson F. Sayford School/Lab Health Systems

Sponsor: Kennestone Regional Health Care System; Marietta, GA

Type Agreement: Purchase Order #K-04660

Award Period: From 2/15/82 To 3/31/82 (Performance) ------- (Reports)

Sponsor Amount: $2,496 Contracted through:

Cost Sharing: N/A ~~GTRI~~/GIT

Title: Productivity Monitoring System Development For Kennestone Hospital

ADMINISTRATIVE DATA

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Defense Priority Rating: N/A

Security Classification: N/A

RESTRICTIONS

See Attached N/A Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval – Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with N/A

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FORM OCA 4:78

GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION SHEET

Date 5/31/82

Project Title: Productivity Monitoring System Development for Kennestone Hospital

Project No: E-22-616

Project Director: Nelson F. Sayford

Sponsor: Kennestone Regional Health Care System; Marietta, GA

Effective Termination Date: 3/31/82

Clearance of Accounting Charges: 3/31/82

Grant/Contract Closeout Actions Remaining:

- [x] Final Invoice and Closing Documents
- [ ] Final Fiscal Report
- [ ] Final Report of Inventions
- [ ] Govt. Property Inventory & Related Certificate
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Assigned to: Health Systems (School/Laboratory)

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E-22-616

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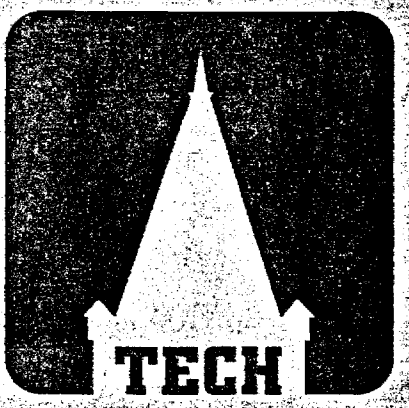

GEORGIA INSTITUTE OF TECHNOLOGY
A Unit of the University System of Georgia
Atlanta, Georgia 30332

PRODUCTIVITY MONITORING SYSTEM DEVELOPMENT FOR KENNESTONE HOSPITAL

A COMMUNITY OUTREACH PROGRAM PROJECT

Submitted To
Kennestone Hospital
Marietta, GA 30060

by

Mr. Nelson F. Sayford
Dr. Thomas H. Bowlin
of the
Health Systems Research Center

May 1982

SUMMARY

The concept of productivity and its improvement has become a vital issue for the American economy; and the health care industry is no exception. During the months of February and March 1982, Kennestone Hospital launched a program which will enable administration and department heads, alike, to begin to monitor and control productivity within the institution. Working through Brue Chandler with assistance from Glenn Black, Bonnie Phipps, Jane Shaw, Buddy Ayers and numerous other hospital personnel, the project reported herein was conducted to: 1) investigate Kennestone's present position and potential with regard to productivity monitoring; 2) propose a hospital-wide method of measuring productivity; and 3) test this system in the Radiology Department.

Using the output/input definition of productivity, the first step in the project was to define appropriate output measures for the hospital's departments. Once this was accomplished the logical second step was to find a convenient way through which these output data could be routinely collected on a timely basis. Since a manual system would entail a fair amount of additional paper work for department personnel, a serious effort to use regularly compiled computerized data was launched.

The most comprehensive source of computerized transaction counts was the Revenue Statistical Summary (RSS), prepared monthly. The main problem with using the RSS transaction counts is the manner in which these transactions are compiled by the computer system. No separation of billed procedures from other items like supply charges, drug charges, and STAT charges is reflected in the transaction totals shown in the

the RSS which causes a considerable difference in these RSS counts and the manual counts reported by department heads. A method to separate these various charges into more useful categories was proposed and implemented by Financial Affairs on a test basis in Radiology.

Once accurate procedure statistics have been generated by the computer system they may be aggregated on a pay period basis and matched with corresponding input data, man-hours worked, to calculate a productivity index. The calculation of bi-weekly productivity indices will allow a timely comparison of productivity from one pay period to another and will eventually allow a productivity baseline or target to be established. This would facilitate tighter control of personnel utilization and could even form the basis for an incentive system to be implemented in the hospital's production centers.

A test of this system and the establishment of a productivity baseline is currently being conducted in Radiology, and this will form the basis for implementation of a debugged system in other departments.

Future activities should focus on familiarizing hospital department heads with the Productivity Monitoring System as well as reviewing the reporting and use of MoniTREND data.

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INTRODUCTION

Productivity improvement is an issue that is emerging as one of the most pressing needs in the United States economy, and certainly the hospital industry has not escaped the dismal pattern that productivity levels have followed over the last two decades. With the $200 billion plus health care industry devoting over 40% of these costs to hospital care there is more and more attention being paid to how hospitals cope with their productivity situation. Unfortunately, the hospitals have traditionally followed the remainder of service sector industries and productivity increases in the service sector have always lagged behind the increases in manufacturing industries. Thus, the hospital industry may reasonably be expected to have fared no better than to have increased productivity by 3.2 percent per year for the period 1947-1966, by 1.5 percent per year from 1966 to 1977, and, according to current estimates, to have had no more than a 0.5 percent per year increase in productivity during the most recent few years. Though it is probably unreasonable to suggest that greater attention to an issue like productivity improvement could have any radical effect on spiraling hospital care costs, it is not unreasonable to believe that the growth trend in numbers of personnel employed in hospitals (e.g., from 279 full-time equivalents per 100 adjusted census in 1972 to 324 full-time equivalents in 1978) might be significantly altered through closer attention to productivity of hospitals' employees. Indeed, in an industry which is noted for the infusion of capital into new, sophisticated equipment which provides certain productivity improvements in and of itself, the attention to labor productivity is one of the most relevant strategies that hospitals have for gaining control of their own

costs and favorably influencing their trend of productivity increase

Kennestone Hospital appears to be making an organized, well-considered effort to achieve an understanding of the Hospital's situation with respect to productivity. The project which forms the basis for this report is a useful first step for the Hospital, yielding a variety of information which can be of immediate benefit, and providing the foundation for further work to achieve productivity levels desired by the Hospital.

Nature of Project

The project reported upon here was suggested by and then coordinated through the office of Kennestone Hospital's Associate Administrator, Mr. Brue Chandler. The Health Systems Research Center of Georgia Tech conducted the project, with the following four objectives:

1. To investigate Kennestone Hospital's needs, capabilities, and current status with regard to an institutional productivity monitoring system (PMS);
2. To structure a PMS to meet the institution's needs;
3. To conduct a pilot test of the PMS in the Radiology Department; and
4. To establish a productivity baseline (using the PMS) for the Radiology Department.

The project strategy included close cooperation with Hospital personnel, extensive efforts to gain departmental inputs into the PMS design phase of the project, and close attention to integrating productivity monitoring into the existing managerial processes. To the maximum reasonable extent the data collection, reporting and analysis functions related to a proposed PMS were drawn from existing procedural patterns at Kennestone Hospital.

PRODUCTIVITY MONITORING

Productivity is usually defined as the ratio of outputs--goods and services produced--to the totality of inputs that contributed to output production, i.e.,

$$\text{Productivity} = \frac{\text{Output}}{\text{Input}},$$

where the output is measured in units different from the units used in measuring input. In practical application, usually the input and output measurements only incorporate subsets of these factors; in particular, and for purposes of this study, the input of most concern is the labor input, and output is measured in various units all of which represent the most comprehensive single "output" reflective of an individual hospital department's work. Typical measures of productivity are "lab tests per man-hour" for the Laboratory, "procedures per man-hour" in Radiology, and "meals per man-hour" in the Dietary Department. Specific recommended measures of productivity for Kennestone Hospital will be presented later.

Productivity Monitoring Concepts

It is clear that the acquisition--through internal development--of a PMS represents only one small part of a total emphasis on improving an institution's productivity experience. In fact, productivity monitoring can only indirectly influence the level of productivity; activities which use the PMS as a basic informational device to identify problem areas provide more significant possiblities in influencing productivity than a PMS alone. For example, inefficient work methods or procedures, inadequate personnel training, poor personnel scheduling and a variety of other problems can be pinpointed through a PMS--project activities must then follow to make significant improvements possible (i.e., management

engineering-type work).

At a generic level, there are three principal methods by which productivity monitoring proceeds. The methods are:

1. Internal comparisons (longitudinal, by department),
2. External comparisons (multi-hospital groupings), and
3. Engineered standards.

Each of these methods are discussed below.

Regardless of the particular method(s) employed, a frequent calculation related to productivity and used as a general index of operations is (departmental) efficiency. An efficiency index is calculated by dividing productivity for a current period by a target--or commonly termed "baseline"--productivity. Whether the target is derived through review of past internal situations, as a "baseline" is usually derived, or through another approach, the establishment of such targets (by department) is an important part of a total PMS.

Internal Comparisons

Internal comparisons used to monitor productivity usually consist of developing a productivity baseline against which subsequent periods' productivity is compared. One of the most well-known examples of internal comparison systems is utilized in Mt. Sinai Hospital's Laboratory, and the productivity monitoring system employed by the Carolina Hospital Improvement Program (CHIP), called "PAR-C", is an example of a hospital-wide system of internal comparison.

Calculating a period's productivity for a department and comparing this result with an appropriately determined baseline forms the basis of a relatively unsophisticated PMS, but a type of PMS often seen in the initial stage of a hospital's concern for productivity improvement.

External Comparisons

A second method of monitoring productivity involves the use of external data, i.e., productivity data from other institutions. One of the most widely used of these external measures systems is the system operated by Hospital Administrative Services (HAS), called the MoniTREND system, which provides monthly indicators of department-level productivity. MoniTREND information consists of comparing a particular hospital's department productivity levels with similar data from other hospitals, with each hospital determining what groupings of institutions it would desire to be compared against with respect to productivity. The system also provides participating facilities with internal comparison information on the same indicators used for the external comparisons.

In a slightly different approach, external comparisons can be conducted among small groups of hospitals, all of which are willing to share productivity data in a less formalized format than that of systems such as MoniTREND. There are examples of such arrangements throughout the United States, such as the sharing done within the Delaware Valley Hospital Association. Such arrangements may or may not treat hospitals' data in a detached manner, i.e., with participants' data identified as belonging to a particular facility.

Engineered Standards

The third major method of initiating a productivity monitoring emphasis is through the use of engineered standards, i.e., standards as to the time requirements for activities in hospital departments which are derived through technically sound procedures. The application of engineered standards takes two general forms: developing engineered standards at and for the particular hospital, or using a pre-determined set of engineered standards. In the former case, standards are developed for an institution, by department, through techniques such as time study or work measurement, with the intention that

standards developed are for use in the developing environment (hospital) only. Pre-determined standards are, on the other hand, developed in more than one facility, and thus represent "average" standards that may be applicable for (theoretically) all hospitals. Usually pre-determined standards must be modified and "fitted" to individual hospitals using these standards.

There are positive and negative features of each of the two means for arriving at standards for a hospital. Pre-determined standards have the obvious time-saving characteristic of requiring only "fitting" rather than the extensive study effort required in developing institution-specific standards. The major negative feature of the pre-determined standards is that such standards may not really "fit" into a particular hospital due to unique aspects of that hospital's environment. If procedures, work methods, equipment and other significant factors in producing outputs for a hospital's departments are not identical to those which existed in facilities where the pre-determined standards were developed, major problems in implementing the pre-determined standards may arise. The hospital which develops its own standards avoids this potential problem area, though such a development effort usually requires professional technical assistance and can require long periods of time.

Whether pre-determined standards are utilized or institution-specific standards are developed, the application to productivity monitoring follows an identical pattern. The standards will usually take the form of a "constant" component and a "variable" component for each department. Constant components represent all activities performed which do not depend upon a workload demand which varies in a significant way (i.e., a workload related to a separate, "independent" variable which can be defined). Using a simple example of washing dishes, the filling of the sink, adding soap and other preparatory

actions are considered to be constant components since these are not significantl influenced by the number of dishes to be washed. The variable components to the dish washing activity would include scrubbing, rinsing and drying of dishes--all activities which do depend upon the independent variable "number of dishes." A standard for dish washing might look like:

$$\underset{\text{(constant)}}{0.53 \text{ hrs./load}} + \underset{\text{(variable)}}{0.01 \text{ hrs./dish}} ,$$

and knowledge of how many loads of dishes were to be washed and the total number of dishes involved would permit the determination of time required to complete the dish washing activity. Once such an estimate was determined, the actual time required to complete this activity might be compared to the estimated (standard) time to determine the efficiency with which dish washing was done, i.e.,

$$\text{Efficiency} = \frac{\text{Actual Time}}{\text{Estimated (Standard) Time}} .$$

The obvious requirement of utilizing engineered standards is obtaining such standards, and this requires either procurement of a pre-determined standards system or development of the standards at Kennestone Hospital.

Available Productivity Monitoring Resources

Resources that might be applied to development of a PMS for Kennestone Hospital include both (a) ongoing productivity-related data collection and analysis activities at the Hospital, and (b) information, techniques and concepts which are not currently used at the Hospital but which do exist and might be integrated into PMS development. Ongoing activities which relate to PMS development are addressed in a subsequent section of the report. Discussion here is devoted to a review of resources which are either not used at Kennestone Hospital or are in use but not fully understood and/or

utilized.

Analysis of the variety of resources available for use in developing a PMS for Kennestone Hospital led to a focus on three particular categories of resources, these being

1. Hospital-wide productivity measurement systems,
2. Pre-determined standards systems, and
3. HAS's MoniTREND system.

These resources are worth considering for the insight they provide into techniques for data collection and classification, reporting formats and report content, and many other aspects of creating an operational PMS.

Hospital-Wide Productivity Measurement Systems

Productivity measurement systems provide the basic content of a PMS development effort in that the monitoring function only can occur when there is a clear identification of what is to be measured and assessed. With this as a given, it is useful to investigate what commonly referenced measurement systems suggest is worthwhile measuring.

Measurement schemes which encompass large proportions of a typical hospital's departments do exist, though no single scheme of measurement can be cited which includes the full range of departments at Kennestone Hospital. Beyond the implicit measurement schemes embodied in standard data systems, there are few schemes suggested for application in a productivity monitoring context. The American Hospital Association (AHA) has suggested one scheme of measuring departmental services (outputs) in the Uniform Hospital Definitions booklet, as shown in Table 1. The measurements presented by AHA are significantly different from those used in the common pre-determined standards systems and MoniTREND, whose measurement schemes are discussed later in this section.

Table 1

Suggested Measures of Service from AHA's
Uniform Hospital Definitions

Department	Measure of Service
Anesthesiology	(1) Number of Patients (2) Hours of Administration and Use
Basal Metabolism	Number of Tests
Blood Bank	Number of 500-cc. Units Prepared for Transfusions
Central Supply	Dollar Value of Processed Requisitions
Delivery Rooms	Number of Deliveries
Dietary	Number of Meals Served
Electrocardiology	Number of Examinations
Housekeeping	Hours of Service Rendered to Various Departments
Inhalation Therapy	Number of Hours that Oxygen is Administered
Laboratory	Number of Tests
Laundry	Pounds or Pieces of Laundry Processed
Nursing	Hours or Days of Service
Occupational Therapy	Hours of Teaching and Supervision
Operation of Plant	(1) Thousands of Pounds of Steam Produced, plus (2) Pounds of Ice Manufactured, plus (3) Kilowatt Hours of Electricity Produced
Operating Rooms	(1) Number of Operations (2) Hours of Use
Pharmacy	Dollar Value of Prescriptions and Requisitions Processed
Physical Therapy	Number of Treatments
Postoperative or Post-anesthesia Recovery Rooms	Number of Patient Hours of Service
Radiology/Diagnostic	(1) Number of Films Taken, plus (2) Number of Fluoroscopic Examinations
Radiology/Therapeutic	(1) Number of X-ray Treatments, plus (2) Number of Radium Implementations, plus (3) Number of Treatments by Radioactive Elements

Pre-determined Standards Systems

Factors that must be carefully considered when contemplating use of a pre-determined standards system include (a) departmental coverage inherent in the system; (b) cost of implementing the system, which includes procurement and any technical assistance; and (c) time frame for implementation. In general it must also be remembered that the pre-determined standards only provide one component of the total PMS, and that the most effective use comes from department by department use to develop standards that are valid for and accepted by the departments.

To illustrate the range of factors mentioned above as related to specific pre-determined standards systems, two commonly used pre-determined standards systems can be discussed: the Commission for Administrative Services in Hospitals (CASH) system, and the Resource Monitoring System (RMS) as developed through the Hospital Management Engineering Program serving the Hospital Association of New York State. Each of these systems has certain properties which can aid in understanding their possible roles in developing a PMS for Kennestone Hospital through use of such systems.

Both the CASH system and RMS cover an extensive number of hospital departments, with each system exhibiting slightly different departmental designations. The CASH system includes 32 departments, 18 of which have variable/constant standards and 14 departments which are included through less rigorous standards (i.e., generalized levels of expected performance for the total hospital). The RMS covers 15 departments, some of which represent a combination of separate departments that exist at Kennestone Hospital. Overall, the two systems provide coverage of the major employment centers for a hospital; it is estimated that more than 90% of a typical hospital's employees would be covered through either of these systems.

Although each of the systems can be acquired through a purchasing arrangement, both systems suggest that technical assistance will be necessary in implementation activities. Thus, there are both procurement costs and technical assistance costs associated with implementing these pre-determined standards systems. No cost was found for the CASH system, but a recent acquisition of RMS involved more than $1200. Estimates are that implementation of either system requires approximately three months in typical hospitals, and RMS literature puts the time required for departmental implementations at two to four weeks per department.

There is a high degree of consistency between the CASH system and RMS with respect to the units used for output measurement in departments. Both systems rely on the variable/constant standards components for the bulk of departments. Table 2 shows the units used in measuring the variable workload for those departments covered with variable/constant-type standards in at least one of the two systems.

One aspect of RMS not shared by the CASH system are identified ranges, called "guidelines," which define what a hospital should expect as reasonable standards for selected departments. Unfortunately, many of the ranges provided relate to a technique of standard development other than that embodied in the standards given, i.e., the combining of variable and constant components into a single component which uses a variable workload measure for output. For example, where the Admissions Department standards in RMS are stated in terms of a variable component ("man-hours per admission") and a constant component ("man-hours per calendar day"), the range guidelines are stated in terms of a measure "man-hours per patient day" which is entirely different than the output measure (admission) used in the variable component of standards development.

Table 2

Units for Measuring Departments' Variable Workload in the CASH System and RMS

Department	CASH System	RMS
Admissions	Admission	Admission
Business Office	Discharge/ Outpt. Visit	Discharge/ Outpt. Visit
Central Supply	Patient Day	Patient Day
Dietary	Patient Day	Patient Day
Emergency	Case	Case
Housekeeping	Patient Day	+
Inhalation Therapy	IPPB Treatment	*
Laboratory	Test	Test
Laundry	Patient Day	Pound
Linen	Patient Day	Pound
Maintenance/Plant Operations	Patient Day	+
Medical Records	Discharge	Discharge
Nuclear Medicine	Treatment	*
Nursing	Patient Day	Patient Day
Pharmacy	Prescription	Prescription
Physical Therapy	Treatment	Modality
Radiology	Procedure	Procedure
Recovery	Case	Case
Surgery	Case	Case
Technical Services (Cardio.-Pul./ Neuro. - EKG, EEG, EMG)	Treatment	*

\+ no variable workload measurement in this system.

* department not covered in this system.

MoniTREND System

With over 3000 hospitals participating in the MoniTREND system the information provided to institutions through monthly reports are an extremely useful resource. In particular, MoniTREND reports include productivity measurements for a significant proportion of hospital departments, with productivity monitoring also being a part of these reports. In fact, there are several monitoring-type informational strategies incorporated into the MoniTREND reports, yielding many possible approaches to using the reports. Both internal comparison and external comparison data are included in the reports, with a baseline system to support internal comparison and a multi-hospital median productivity figure for external comparison.

The MoniTREND system provides productivity information through measures which are quite similar to those used in pre-determined standards systems, except that where pre-determined standards systems emphasize worked man-hours the MoniTREND system is based on paid man-hours. This fact, coupled with certain aspects of data reporting and analysis, does create some problems in using MoniTREND information, though there are methods by which some of these problems can be minimized.

KENNESTONE HOSPITAL'S EXPERIENCE WITH PRODUCTIVITY MONITORING

Review of existing data collection, reporting and analysis functions at Kennestone Hospital revealed that much of the information that would be required in a hospital-wide PMS is being generated by the Hospital's departments, but that only limited efforts are being made to synthesize various information "flows" to arrive at what can truly be termed productivity measures. In those departments where such measurement is ongoing the requisite data are captured through manual and/or computerized processes.

With the PMS to focus on labor productivity, good man-hour data are essential for development and the Hospital appears to have a satisfactory means for gathering these data. The time card system in use is certainly sufficient to support development of a PMS which is, as discussed later, appropriate for present purposes of the Hospital. At the individual department level, the present aggregation approach to reporting man-hours can be integrated directly into a PMS.

Review of present efforts made to measure departmental outputs showed that output measurement is a regular aspect to the operations of many, but certainly not all, departments of the Hospital. Manual and computerized methods are used to capture the output data. Since the decisions as to what measurement units should be used in the various departments has remained with department-level managers, and except for the system of output measurement required by the MoniTREND system, there is wide variation in the quality of measurement activities and in the quantity of output-related data resident in the departments. The general pattern which emerges with respect to output measurement is that departments which generate revenues have--via the computerized charging system in use--at least one and often two separate methods for measuring outputs, where

non-revenue producing departments generally do not collect output data which is specific to those departments (i.e., which reflects internally useful, valid measures other than the generic output measures such as patient days, etc.).

Feedback Gathered Through Survey Distributed to Department Managers

One important aspect of the project was, by design, the involvement of department managers. It was considered important that the notion of productivity be raised with department managers, with some increase in interest expected through becoming involved in project activities. One of the initial steps in achieving such involvement was distribution of a questionnaire to department managers, with the questions included related to their experience with and attitudes toward productivity monitoring. The questionnaire, shown in Appendix A , sought inputs as to the quantity and quality of existing productivity monitoring activities within individual departments of Kennestone Hospital.

Of the total number of questionnaires distributed, 27 questionnaires were completed and returned. In general, those questionnaires returned were from service and administrative departments, with a few respondents from nursing service. This pattern of response was not unexpected as the majority of departments represented with returned questionnaires were revenue producing units where measurement of outputs and concepts relevant to productivity monitoring are naturally more prevalent. There might also be reason to believe that those departments responding in the survey were more interested in or concerned about productivity monitoring than non-responding departments, though such a conclusion had no bearing on the manner in which the questionnaire data were analyzed.

While no attempt is made to suggest that the sample of departments which are represented by returned questionnaires is "representative" of

all departments at Kennestone Hospital, the results from the survey, as included in detail in Appendix A , are of significance. There are certain conclusions that can be drawn from analysis of the returned questionnaires; these conclusions are as follows:

1. There appears to be a receptive climate for productivity monitoring among departments;
2. There appears to be a general, "user-oriented" knowledge of how a PMS might be used operationally;
3. It appears that the concepts of productivity, output measures, and related matters are more common in and understood by revenue producing departments and support departments (e.g., Dietary Department); and
4. Though responses were gathered which suggested that specific departments did have standards for productivity, the actual measurements being made fit into the category of output measurement more than productivity measurement, with the implication that there may be a low level of understanding with respect to standard data systems.

It was encouraging to note the general level of understanding with respect to productivity as reflected in the quality of completed questionnaires.

Feedback Gathered Through Interviews of Department Managers

Another approach to involving department managers and increasing the visibility level of productivity concepts was a series of interviews conducted at the Hospital. Department managers or their selected representatives were interviewed from the following departments: Radiology, Pulmonary Services, Laboratory, Surgery, Maintenance, and Dietary. While the original purpose of these interviews was, among others, to gain insight into the current status and problems associated with productivity monitoring as perceived by managers, the interviews yielded a wealth of information beyond initial hopes, including many ideas for follow-on projects. Suggestions for such follow-on projects are included later in this report.

The format for interviews was largely unstructured, with individual interviews lasting from 45 minutes to one hour. The detailed summary of the

interviews is included in Appendix B, except that the interview in Radiology is integrated into the section of the report titled "Productivity Monitoring in the Radiology Department."

Review of the interview information did suggest certain common concerns and problems related to productivity monitoring, and these issues are taken up in the following sub-section of the report. In general, all interviews provided further reinforcement of the conclusion that department managers are quite receptive to being assisted by an effective PMS, and seem to be willing to participate in developing such a system.

Existing Problems Related to Productivity Monitoring

Many of the elements required for a PMS are in place at Kennestone Hospital; however, there are a variety of problems which exist to make the implementation of such a system more than a trivial process. In general, the problems can be grouped into two categories: conceptual problems, and operational problems. Conceptual problems include issues such as the appropriate definition of output measures for individual departments, the basic notion of monitoring a measure like productivity, a lack of familiarity with establishing standards for performance measurement, and a basic lack of experience in utilizing productivity-related information. Although the particular problem of the absence of standards for most departments can be side-stepped if a method such as internal comparison is used as a basis for PMS development (with a simple baseline comparison technique), the more useful designs for a PMS would require that effort be expended to establish legitimate standards for departments and this could, potentially, be the greatest problem in implementing a PMS. The remainder of conceptual problems are not difficult to deal with, and would simply require planning of activities to address each problem and satisfactorily resolve the entire group.

Operational problems include the specific methods by which data are presently collected and aggregated (i.e., labor man-hours and output measures); the sometimes inconsistent "counting" procedures involved in measuring outputs versus, say, accruing financially-oriented records; the "flows" of labor and output data into reports; the differences which exist in how the various categories of department provide output data; and the general lack of a systematic approach to integrating the types of information which would comprise an effective PMS. Investigations made during the project suggest that all of these operational problems have solutions and, like the conceptual problems, will require planning as to their eventual solution--implying, of course, some level of expense to the Hospital.

It may be useful, here, to mention the range of problems suggested through the department head--or representative--interviews. In all cases the departments were concerned that reports of output adequately reflect the work being performed, and were concerned that their manual approaches to output measurement did not usually agree with counts on the Revenue Statistical Summary (RSS). There are clear problems with definition of output measures, and with the guideline-mandated approaches to measurement integral to MoniTREND. Finally, there is some concern that standards be developed for certain specific departments to replace what are considered to be invalid "standards" presently in use.

THE HOSPITAL-WIDE PRODUCTIVITY MONITORING SYSTEM

There are many factors to consider when designing a hospital-wide productivity monitoring system. To be of real use to a department manager, a PMS must be timely and relatively easy to use, it must take into account the current resources and capabilities that exist within the institution to generate and maintain such a system, and it must complement other systems already in place. After analyzing the situation at Kennestone, using the design constraints provided by the hospital's administration, the following design criteria were used to develop the proposed system:

1. The PMS should report bi-weekly results;
2. The PMS should be computer-based;
3. The computer-based PMS system should be able to generate some MoniTREND data;
4. The PMS should be capable of including all departments, while realizing that all departments might not require the same level of attention
5. The PMS should be developed in phases, or levels, to facilitate a smooth implementation; and
6. The PMS should be designed so as not to replace or compete with MoniTREND activities currently underway.

Departmental Productivity Indices

The first step in the hospital-wide PMS design process was the selection of appropriate measures of departmental productivity. After reviewing the available literature and discussing this matter with hospital personnel, the productivity measures shown in Table 3 were chosen. It should be noted that given the current status of the computer system, some departments are shown with two productivity measures. The first is the recommended measure to be used during the initial phases of the PMS activities, with the second recommended for use when the appropriate output measure can be included in the computer system.

Table 3

Departmental Productivity Indices

Department	Initial Measure	Preferred Measure (if different from initial)
Administration	calendar days/man-hour worked	
Staff Services*	calendar days/man-hour worked	
Security	1000 sq. ft./man-hour worked	
Financial Affairs	calendar days/man-hour worked	
General Services		
Food Service	patient days/man-hour worked	meals served/man-hr. worke
Maintenance	1000 sq. ft./man-hour worked	requests & PMs completed/ man-hr. worked
Housekeeping	1000 sq. ft./man-hour worked	
Purchasing	calendar days/man-hour worked	orders processed/man-hr. worked
Laundry	patient days/man-hour worked	100 pounds of laundry/ man-hr. worked
Central Supply	patient days/man-hour worked	
SPD	patient days/man-hour worked	
Professional Services*	procedures/man-hour worked	
Emergency	ER visits/man-hour worked	
Infection Control	calendar days/man-hour worked	
Laboratory	tests completed/man-hour worked	
Medical Records	patient days/man-hour worked	records completed/man-hr. worked
Pharmacy	requests filled/man-hour worked	
Patient Services		

* all departments would have the indicated division measure with the exception of those departments listed.

Looking down the list in Table 3, one can see that the concept of measuring productivity is most meaningful when considering revenue-producing and/or production-oriented departments. Those departments whose measures of productivity are shown as patient days (or adjusted patient days) per man-hour worked or calendar days per man-hour worked are the ones for which it is less meaningful to consider the concept of productivity. For some of these departments, alternative productivity measures have been proposed and can be incorporated in the PMS at such time as the appropriate output measures have been added to the set of data routinely picked up by the computer system. Since many of these administrative areas are staffed mainly by salaried personnel, the tie-in of these areas to the computer based PMS would be even less critical. Perhaps a dollar paid basis would need to be considered when dealing with departments with primarially salaried personnel.

The Radiology Department Test

The second step was to test the PMS in one revenue-generating department - - Radiology. Using the bi-weekly criterion, a test is under way in the Radiology Department to see if it is, in fact, feasible to generate and collect computer-based statistics to feed the hospital-wide PMS. The advantages of the computer-based approach when compared with a manual approach are numerous; however, the overriding advantage is the ease of operating the system. Only those inputs normally supplied by the Radiology Department are required ie. the bi-weekly time cards and the patient-by-patient charges entered on the HBO system. During the test period, data control will aggregate 14-days worth of daily revenue statistics to be matched with the time card data from the same period to be used to develop the productivity input. Further information regarding this test is included in "Productivity Monitoring in the Radiology Department."

Once the manual system has operated long enough to instill confidence, the process can be computerized and data processing can automatically aggregate the daily statistics, match these with the time card data, and perform the productivity index calculation. These calculated productivity indices may then be compared from period to period to note increasing or decreasing trends. A representative sample of these indices might be selected, averaged, and used as the basis for the establishment of a productivity baseline from which efficiency calculations can be made, using the formula:

$$\text{Efficiency} = \frac{\text{current period productivity}}{\text{baseline productivity}}$$

A bi-weekly Productivity Monitoring Report similar to that shown in Figure 1 could be generated for each department manager.

Figure 1

PRODUCTIVITY MONITORING REPORT

Department:

Period Covered by this Report:

Productivity Measure Used (output/input):

Output this Period:

Input this Period:

Productivity this Period:

Baseline or Target Productivity:

Efficiency this Period (Productivity this Period/Baseline or Target Productivity):

Historical Data

1. Last Six Periods: Productivity Efficiency
   1.
   2.
   3.
   4.
   5.
   6.
2. This Period Last Year:
3. Year to Date Averages:

The Productivity Baseline

One of the concepts implicit in the Productivity Monitoring Report is that of establishing a productivity target or baseline. In the initial PMS implementation, this baseline would most probably be the average of the previous periods' productivity indices. After the PMS has been in operation for a period of time this fluctuating baseline could be stabilized. At this point some negotiated target, perhaps the average of the first six months' data, would be selected and installed as the productivity target for the department. As circumstances dictate, this target might be re-negotiated at some later date.

Once a stable target has been established, a new section could be added to the Productivity Monitoring Report which would give a graphical representation of the last 26 periods' data. This would go on the lower half of the Productivity Monitoring Report and a completed report might look something like what is shown in Figure 2, where the dashed line represents the baseline or target productivity.

Figure 2

PRODUCTIVITY MONITORING REPORT

Department: Radiology--Diagnostic

Period Covered by this Report: 04-11-82 through 04-24-82

Productivity Measure Used (output/input): Procedures/Man-hour

Output this Period: 3,024 Procedures

Input this Period: 3,540.2 Man-hours

Productivity this Period: 0.854 Procedures/Man-hour

Baseline or Target Productivity: To be established

Efficiency this Period (Productivity this Period/Baseline or Target Productivity): N/A

Historical Data

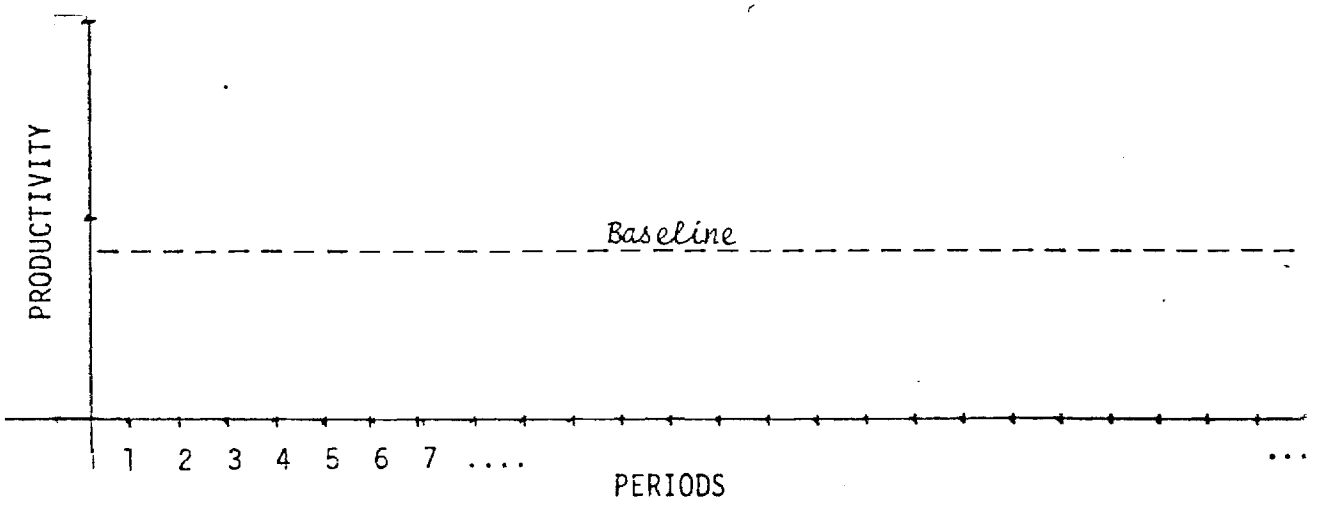
1. Last Six Periods:

	Productivity	Efficiency
1.		
2.		
3.		
4.		
5.		
6.		

2. This Period Last Year:

3. Year to Date Averages:

4. Plot of Previous 26 Pay Periods' Productivity:



PRODUCTIVITY MONITORING IN THE RADIOLOGY DEPARTMENT

As established through definition of objectives for the project, the Radiology Department was the focus of attention in testing the basic plan by which the hospital-wide PMS could be implemented throughout the hospital. In addition, a productivity baseline was to be developed for the Department. As the project progressed, it became clear that certain design issues which concerned the entire hospital were absorbing time which was originally conceived as having been available for use in designing - - with detailed specifications, proecedures, etc. - - the Radiology Department's component of the hospital-wide PMS. However, while further work is needed to arrive at a final design in the Radiology Department, the basic design issues for this Department have been considered and modifications suggested which begin to bring the productivity monitoring function in this Department into alignment with the proposed hospital-wide PMS.

Current Status of Productivity Monitoring

The Radiology Department is divided into five operational sections: Diagnostic Radiology, Radiation Therapy, CT Scanner, Nuclear Medicine and Ultrasound. For purposes of monitoring productivity and keeping track of work counts, these sections should be considered separately. The fact that there is little interaction among the employees assigned to the different sections makes this relatively simple to do. The problems noted in other departments, such as the laboratory, with the allocation of workers' time to different

sections fortunately does not exist in the Radiology Department.

Radiology participates in two basic productivity monitoring systems: MoniTREND and the DuPont Imaging MIS. Both of these systems require the compilation of manual workload and man-hour statistics. The MoniTREND system allows Kennestone to make comparisons of internal operations against those of other local, regional and national institutions of the same size. Comparisons are made using the following indicators.

1. Procedures/adjusted discharge (not used for Nuclear Medicine)
2. Revenue/procedure
3. Direct expense/procedure
4. Salary expense/procedure
5. Physician remuneration/procedure
6. Total expense/revenue
7. Direct expense percentage
8. Outpatient revenue percentage
9. Paid hours/procedures

Statistics are generated for these indicators in all sections except Ultrasound (which is included in Diagnostic Radiology).

One of the problems noted with the MoniTREND data is the manner in which procedures are currently being counted. There are guidelines established by Monitrend in the Guide for Uniform Reporting for three of the five Radiology sections, which state how procedures are to be counted. These guidelines are reprinted below:

1. Radiology-Diagnostic

   Procedures: Report the total number of diagnostic

procedures (a procedure performed to aid in identification of a disease or injury). A procedure is defined as only one area examined and for which a charge is made, regardless of the number of views or films used. For example, examination of an injured elbow and an ankle is counted as two procedures even though several views are taken. A combination of a fluoroscopic examination and x-ray of one area is counted as two procedures.

2. Radiology-therapeutic

   Procedures: Report the total number of therapeutic procedures. A therapeutic procedure is defined as a procedure used in the treatment of a disease or disorder, for which a charge is made.

3. CT Scanner

   Procedures: Each computed tomographic scanner procedure is counted as one procedure (a patient procedure is the initial scan of an anatomical area during a single visit; additional scans of the same area are not counted). Count only those procedures for which patients are charged.

No procedure counts are required for Nuclear Medicine, and consequently, no procedure-related statistics are generated. Ultrasound is not listed in the Guide at all and no separate MoniTREND reporting is currently done for Ultrasound Departments.

An analysis of the procedure counts shown on the RSS for February 1982 versus the manual procedure counts generated for Monitrend showed that, in fact, discrepancies do exist in these two counts. These discrepancies are shown below, by section:

Section	RSS count	Monitrend count
Radiology-Diagnostic	6047	5358
Radiology-therapy	1103	1074
CT Scanner	255	295
Nuclear Medicine*	215	354
Ultrasound**	285	302

* not reported to MoniTREND, but counted nevertheless.
** reported with Diagnostic Radiology.

A section-by-section attempt to reconcile these numbers uncovered some interesting problems with the current computer system's procedure counting programming. Analyzing the procedure counts in diagnostic radiology, the computer (RSS) count of procedures for February was 6047 billed procedures, while the Monitrend count was only 5358, leaving a discrepancy of some 690 procedures. It turns out that under the current computer system programming any charge is counted as a billed procedure. In searching for charges that were not procedures there were 482 portable x-rays done in February and these portable charges were added to the procedure count, even though the actual procedure (chest, abdomen, etc.) was billed under another charge code. In addition, there were 141 miscellaneous supply charges billed and counted as procedures. These, then, account for 623 of the 690 procedures in question, leaving 66, or about one percent unaccounted for. Realizing that the comparison is being made between a manual count and a charge-based computer system, perhaps the one percent represents miscounting of the manual log entries or billing errors, which will be mentioned briefly later.

Looking in detail at the other four sections revealed similar problems, with close reconciliation in all areas except Nuclear Medicine. In general, items such as STAT charges, late charges, miscellaneous supply charges, drug charges, equipment or room use charges, on-call exam charges, portable exam charges, and the like should not be counted as procedures. The easiest way found to weed these out was to take a copy of the charge description master to each section leader and spend about 30 minutes looking at each charge code and description to determine if the item should be counted as a procedure or as a miscellaneous expense. The ultimate goal is to develop a computer (RSS) count of

procedures which practically duplicates the manual counts kept by the department. A secondary goal would be to report to Mcni-TREND procedures counted as prescribed in the Guide so that valid comparisons can be made of the Kennestone data with those of other institutions.

An interesting side light to the reconciliation process was the discovery that STAT charges apparently are not currently being picked up from the HBO system by the Burroughs system to go on the patient's bill. It is not known if this is occurring in all departments, or only in Radiology.

It should also be mentioned that the reconciliation of Nuclear Medicine's procedures was impossible since counting in this section is done on patient contacts rather than on billed procedures. For example, if a procedure requires a pre-injection (done in the patient's room) this is recorded as one procedure. If the patient is brought to the department and placed under the gamma camera, this is recorded as a second procedure, and so on for each contact with the patient. Some billed procedures may be counted as many as five times under this system-- this is actually a relative value unit (RVU) way of counting procedures which could be incorporated in the new system.

The second major PMS in use in the Radiology department is the DuPont Imaging MIS. This system provides monthly reports and yearly summaries of direct and indirect expenses related to exams completed. Standards, established by DuPont, are used in the calculation of the direct time required to complete the exams listed. These "standards", however, only account for direct technician time in the room to complete a procedure, with no time allocated for film processing, film filing, report preparation, or patient transportation. All of

these activities are lumped in the indirect category in the DuPont System. This is helpful if you are interested only in projecting a Technologist EFT needed based upon some projected exam workload; but, it is not so helpful if you want to project total departmental EFT based upon projected exams. The "standards" were developed, according to Tom Chambliss (at the home office), by averaging the times indicated to complete procedures as reported in a previous two-year cost control program run by DuPont. No personal time, fatigue or delay allowances are reflected in these "standards", and these would more correctly be termed "normal" times than "standard" times. While the DuPont System probably provides "better" management information than the MoniTREND System, it is still not too timely. DuPont takes several weeks to process and return the results of the submitted data. Appendix C includes a yearly summary of the DuPont data, as well as the "standards".

Changes Proposed to Date

The main change made in the Radiology Department, to date, has been to recode the charge master so that only items which are true procedures get counted as procedures; and all supply item charges and miscellaneous charges are now grouped in another category. Procedures are now being tallied by the computer on a daily basis, and these daily counts are being aggregated by data control on a two-weeks' basis. These aggregated two-weeks' procedure counts, by Radiology Department section, can be applied to the bi-weekly payroll data and a procedure/man-hour measure of productivity can emerge.

In addition to working on the procedure counts, some work still remains to be done with respect to changing the charge codes in the CT Scanner section (and possibly Nuclear Medicine) to better reflect

the actual procedures performed. For example CT scans done with contrast, without contrast or without and with contrast are all coded the same now, even though two or three scans might be required. If these are coded the same, identical charges appear on the patient's bill, even though the workload in the department might be doubled or tripled in some cases. The appropriate codes exist for most of these different procedures, however, indications are that these might not be used at this time. If this problem could be resolved, it would facilitate the concern of counting CT scans in terms of head equivalent scans, used to seek new scanner approval from the HSA. The head equivalent scans could be keyed to charge code and used as an RVU means of counting workload.

Head Equivalences are allocated as follows:

Procedure	RVU (Head Equivalence)
Head without contrast	1.0
Head with contrast	1.25
Head with and without contrast	1.75
Abdomen (including chest) without contrast	1.50
Abdomen with contrast	1.75
Abdomen with and without contrast	2.75

Until such time as improvements can be made on the charge codes it is recommended than manual counts continue to be kept in the CT Scanner section for HSA use. All other areas not politically sensitive might abandon manual counting once some confidence is developed in the computer counts. As long as the ward clerks continue to key the requests, from which the RSS counts are generated, improperly on the floors to subsequently be corrected in the Radiology Department, a potential exists to have charging errors (probably enough to explain the previously mentioned one percent of unreconciled procedures) which could make the manual and computer counts differ. A detailed analysis of improper coding was not done; however, based on observation while in and out of the Radio-

logy office this seemed to be a fairly frequent problem. The discrepancy is discovered when the RT gets the patient's chart and checks the actual order versus the computer order, and this person must then go to the office and have a correct requisition typed and entered on the computer. The old requisition must be credited and the new requisition debited at this time. It might be unrealistic to attribute the total 66 unreconciled procedures to this problem, but some percentage of these would no doubt be candidates for inclusion. It has been suggested that a more detailed charge code listing (with cross references) might help to alleviate some of this problem situation.

The PMS Test in Radiology

Working with personnel from Financial Affairs and EDP, it was decided that a manual test of the proposed bi-weekly system be performed using Radiology as a test department. For each of the five sections within Radiology, daily procedure counts are now being generated by the computer and sent to data control. On a bi-weekly basis (conforming to the current pay period breakdowns), these procedures will be tabulated and consequently matched against the payroll data for the same period to develop the productivity measure: procedures/man-hour/pay period. If the manual test proves successful, steps can be taken to automate this procedure and to then expand it to other revenue producing departments.

Note that the procedures being counted by the computer in this test situation are the billed procedures (not supplies, STAT charges, late charges, etc.) entered in the system which ultimately appear on the patient's bill. This does not account for procedures performed by the department which are not billed, such as employee physicals, work done

for physicians, etc., and perhaps a mechanism needs to be developed to enter such work into the computer system to better reflect actual workload to be credited to the department's productivity calculation. If no convenient method is found for entering these "charges" a slight inaccuracy would be expected in the productivity calculations.

Future Radiology Activities

Using the phased concept for installing the PMS, within the Radiology Department the initial phase would incorporate the measurement of productivity using the index " procedures per man-hour." The second level would introduce the establishment of a baseline developed from averaging the first six periods' worth of productivity data. This baseline would serve (at least in the beginning) as the basis for making efficiency calculations. The final level of application would be the introduction of RVUs or of time standards to provide some weighting of procedures.

EXPANSION OF THE PMS TO OTHER DEPARTMENTS

Using the experience gained in the Radiology Department implementation, it would be relatively easy to expand the PMS to include other revenue-producing departments. This implementation could be accomplished through the following steps.

1. separate procedure codes from miscellaneous codes on the department charge master
2. generate new procedure counts on a daily basis
3. aggregate these daily procedure counts on a bi-weekly (pay period) basis
4. match these aggregated procedure counts with the appropriate man-hours worked
5. calculate the productivity index (generally procedures/man-hour worked)
6. develop a baseline or productivity target
7. calculate the efficiency (Productivity index/Baseline)

The Kennestone staff who assisted with this project should be able to complete these steps with little difficulty. The main problem is to get the computer's count of procedures to accurately reflect reality. The related problem is generating charge codes distinct enough to facilitate accurate procedure counts.

The application of the PMS to administrative departments would be much easier since no procedures get counted in these departments and the steps associated with the charge master can be eliminated. For these areas it is a simple matter to match the patient days or other indicated output measure to the pay period man-hour data and calculate the productivity index. While perhaps less meaningful than the revenue-producing areas' PMS data, as a relative measure, these ad-

ministrative data can be useful when comparing one period or one year with another.

Future PMS Activities Possible

The development of the productivity index for a department represents the first level of implementation of the PMS. The second level would involve the calculation of a productivity target. This leads to the higher, more sophisticated levels of implementation possible.

The potential for assigning standard times to specific procedures, for assigning RVU's to procedures or for counting procedures in ways other than a strict one-to-one basis (such as the head-equivalent scan system) exists for all procedure-based departments with procedure counts on the computer system; and by entering manual work counts for those production-oriented departments which do not generate revenue.

Once standard times have been developed for each procedure in a given area, workload projections can be generated for scheduling and budgeting purposes. The ability to do this centrally, through the computer system makes the potential exciting. The only drawback is the developmental time to get all departments on-line and up-to-speed. For this reason the phase-in approach, starting with the revenue generating departments had been recommended. Get the procedure counts right, match these on a trail basis with the time card data to develop a productivity index and finally, set standards or choose some other means of rating the relative value of a particular procedure in that area.

A spin-off advantage of the daily procedure counting would be the ability to generate a one-page report to all department heads listing the previous days procedure counts. This should satisfy the request

mentioned by several department heads to have such a daily activity report.

POTENTIAL FOLLOW-ON STUDIES

Within the context of the current PMS study, there exist several studies which would be beneficial to the Hospital if pursed as follow-ons to the study here reported. Obviously, the exportation and installation of the Radiology test system and the activities associated with adjusting the charge master in other revenue generating departments would be logical follow-up studies, but these activities could most likely be accomplished by hospital personnel. While the staff on this project are prepared to assist in these "implementation" activities, there are other projects, listed below, which are not necessisarily directly related to installation of a PMS and which might be reasonable next steps at Kennestone Hospital.

1. The development and presentation of a productivity short course for Hospital personnel. This project would have a goal of acquainting personnel with a PMS, and discuss data collection, analysis, etc.
2. The modification of existing productivity monitoring activities in the Laboratory. Due to the complex nature of the Laboratory's structure additional effort (beyond that required in other departments) will be needed if a truly valuable productivity monitoring function is to exist in the Laboratory.
3. A charge structure evaluation of CT scans and Nuclear Medicine procedures. A study of the time, materials, etc., would be helpful in setting appropriate changes.
4. A detailed analysis of the Pulmonary Services Department. A study is needed to assist in the development of standardized treatments and to determine the appropriate charges for such treatments. Standards development would be a part of this study.
5. The development of an inventory control system for the O.R. The study would assist in establishing tighter control over inventories in this area.
6. The development of an O.R. procedure time prediction algorithm. The study would allow better scheduling of rooms, etc.

Some of these studies can be conducted by undergraduate and graduate students

though they may require extensive faculty/staff supervision. Other of the projects suggested would be better handled by staff such as were involved in this project.

APPENDIX A

EXAMPLE DEPARTMENT HEAD SURVEY QUESTIONNAIRE AND ANALYSIS OF RETURNED QUESTIONNAIRES

GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA 30332

SCHOOL OF HEALTH SYSTEMS
COLLEGE OF ENGINEERING

(404) 894-4550

PRODUCTIVITY MONITORING SURVEY

This survey is being distributed in conjunction with a project being conducted by the Health Systems Research Center at Georgia Tech. Please be as complete as possible with your responses. The answers you give will be used in the design of a Productivity Monitoring System for the Kennestone Regional Health Care System. Thanks in advance for your help.

Definitions:

1. Productivity: the ratio of goods and services produced (output) to the resources consumed to produce these goods and services (input), OR:

   $$\frac{\text{Output}}{\text{Input}} \quad \text{(in unlike units)}$$

   such as: tests/man hour (lab), food trays/man hour (dietary)

2. Productivity Monitoring System (PMS): an on-going systematic way of keeping track of a department's productivity where some input data (work counts, hours, paid or worked, patient days, etc.) are used to develop a timely productivity index for the manager. The HAS Monitrend System is an example of a PMS.

3. Standard Data: generally recognized, accurate estimations of times to perform certain tests or procedures in a given area. Some productivity monitoring is done based on standard data.

Please return the completed survey to Administration by 26 March 1982.

DEPARTMENT HEAD SURVEY

Department _____

Name of Person Completing Survey _____

Hospital ( ) Kennestone ( ) Windy Hill

Telephone _____ extens. _____

1. Does your department currently have what you would consider to be an appropriate measure of productivity? If yes what is the measure?
   ( ) Yes ( ) No

2. Does your department currently participate in any productivity monitoring activities (such as the HAS Monitrend System)?
   ( ) Yes ( ) No

   If yes, what systems?

   ( ) HAS Monitrend
   ( ) Other (specify) _____
   ( ) Other (specify) _____

3. Which of these systems do you prefer? _____

4. How frequently do you currently get information from your preferred system?

   ( ) weekly
   ( ) bi-weekly
   ( ) monthly
   ( ) bi-monthly
   ( ) every three months
   ( ) less frequently than every three months
   ( ) don't get any information currently

5. Various levels of standard data are frequently available to department managers for their use. With respect to your operation which of the following statements describe your situation (check all that apply)?

   ( ) a. Standard data exists for my department in the following form (or system) _____

   ( ) b. I use this standard data to evaluate the operation of my department.

   ( ) c. No standard data exists for my department.

   ( ) d. I am aware of standard data being used in this department in other hospitals. Please describe what is used. _____

6. How valuable is the content (ignore time delay problems) of the information you get from your PMS?

( ) totally useless (a waste of time) ( ) almost useless ( ) some value

( ) fairly valuable ( ) can't operate without it

7. To be of benefit to you as a manager, how frequently would you need to get feedback from the PMS? (How long can you wait to get results back from the information you submit to be of any use in managing your department.)

( ) daily
( ) weekly
( ) bi-weekly
( ) monthly
( ) bi-monthly
( ) every three months
( ) less frequently than every three months

8. What use(s) are you currently making of productivity monitoring activities (check all that apply):

( ) staffing/scheduling (personnel)
( ) budgeting
( ) cost containment studies
( ) work scheduling (patients for examination, treatment, etc.)
( ) other (specify) _____

9. If you had an improved PMS what would be your primary use of this system?

( ) staffing/scheduling (personnel)
( ) budgeting
( ) cost containment studies
( ) work scheduling (patients for examination, treatment, etc.)
( ) other (specify) _____

10. ( ) Yes ( ) No Do you personally measure and keep records on the productivity of your department? If yes briefly describe your procedure (measure(s) used, frequently of calculation, method of comparison of one period to another, etc.) _____

_____

_____

_____

_____

_____

11. What specific problems exist within your department that make productivity monitoring and control difficult?

_____

_____

_____

_____

_____

As a means of determining the current status of productivity monitoring at Kennestone, a survey questionnaire was distributed to all department heads in the Kennestone Regional System. Responses were received from the 27 departments shown in Table A1 which also lists the responses to question 1, "Does your department currently have what you would consider to be an appropriate measure of productivity?" As can be seen, 19 departments responded yes with 6 responding no, and 2 not responding. Fourteen of the responding departments indicated their various measures of productivity. One obvious conclusion which can be drawn from this question is that developing a reasonable measure of productivity for a non-revenue generating department is more difficult than for the revenue generating ones.

In answering questions 2 and 3, "Does you department currently participate in any productivity monitoring activities?" "If yes, what systems?" and "Which of these systems do you prefer?" Twenty four departments reported participation in some form of productivity monitoring with Monitrend indicated as one form by 19 of these departments, and an additional 10 systems noted. In only three cases was Monitrend shown as the "preferred" system (see Table A2).

When asked how frequently information is currently provided by their preferred system in question 4, the majority response (15) was monthly (see Table A3) with 8 reporting information being generated with a less than 3 month's frequency. Therefore, 23 departments currently get information on a monthly (or longer) basis. If, in fact, this monthly response reflects Monitrend data, given the turn around time on these data, a period of longer than a month would be expected for these reports to get to the departments.

Question 5 addressed the various levels of standard data available to department managers. The respondents indicated that in respect to their operations the following statements applied:

15 responses a. standard data exists for my department in the following form (or system) _____.
(See Table A4 for specific systems)

13 responses b. I use standard data to evaluate the operation of my department.

Table A1
Responses to Question Number 1

Department	Yes	Measure of Productivity	No
Admissions	X		
Accounting			X
Cardiac Cath. Lab			
Central Supply	X	Revenue Statistics	
Data Processing			X
Emergency	X		
Enterostomal Therapy	X	Daily records, office and progress notes, self care by patient, reduced hospital stay	
Housekeeping	X	Census F.T.E.	
Food Services	X	Number of meals per man/hours	
Internal Audit			X
I.V. Therapy	X	Historic statistics of past month and year	
Laboratory	X	Work load units per man hours	
Laundry	X	Pounds per man hour	
Maint./Engr.	X	Hours worked per available hours	
Medical Records	X	Number of services per person	
O.B./Gyn.			
O.R.	X		
Patient Accounts	X		
Patient Services (Nursing)			X
Pharmacy			X
Pulmonary Services	X	RT Standards	
Purchasing	X	Number of transactions and inventory ratio	
Radiology	X	DuPont Imaging MIS	
Rehabilitation	X		
Social Services	X	Monthly Report	
Surgical			X
S.P.P.	X	Hours per patient day Revenue per patient day	
TOTALS	19		6

Table A2
Responses to Questions Number 2 and 3

Department	No	Yes	Monitrend	Other
Admissions		X	X	
Accounting		X	X	
Cardiac Cath. Lab	X			
Central Supply	X			
Data Processing		X	X	
Emergency		X		Patient count, record of FTE
Enterostomal Therapy		X		*IAET data
Housekeeping		X	X	* (A)
Food Service		X	X	
Internal Audit		X	X	
I.V. Therapy		X		Monthly budget report, pers. position control record
Laboratory		X	X	
Laundry		X	*X	Base line data
Maint./Engr.		X		Work assignment sheets, efficiency reports
Medical Records	X			
O.B./Gyn.		X	X	
O.R.		X	*X	Time and motion studies
Patient Accounts		X	X	Claims processed
Patient Services (Nursing)		X	X	
Pharmacy		X	X	
Pulmonary Services		X	X	*RT System
Purchasing		X	X	
Radiology		X		DuPont Imaging MIS
Rehabilitation		X	X	
Social Services		X	X	
Surgical		X	X	
S.P.P.		X	*X	
TOTAL	3	24	19	10

*Denotes system preferred (A) response was "our own" but was not defined

Table A3
Responses to Question Number 4

Category	Response
weekly	0
bi-weekly	3
monthly	15
bi-monthly	0
every 3 months'	3
less than 3 month frequency	8
no current information	1 (A)

(A) responded to 'no current information' yet also responded to 'less than 3 month frequency' and 'every 3 months'.

9 responses c. No standard data exists for my department.

2 responses d. I am also aware of standard data being used in this department in other hospitals. (See Table A4 for specific systems)

When asked to evaluate the value of the content of PMS information currently received (question 6) the following responses were obtained:

Category	Responses
Totally useless	1
Almost useless	3
Some value	11
Fairly valuable	4
Cannot operate without it	5

When asked how frequently PMS information should be received to be of use in managing a department (question 7) the following responses were obtained:

Category	Total Response	Single Reponses	Multiple Response
a.) daily	2	1	a & e 2
b.) weekly	1	1	b & d 1
c.) bi-weekly	6	5	c & d 1
d.) monthly	13	11	
e.) bi-monthly	1		
f.) every 3 months	2	2	
g.) less than every 3 months	1	1	

The majority vote from department heads would seem to be for monthly information. This response may be partially due to the fact that this is what they

Table A4
Standard Data Systems Indicated in Question 5a

Department	Standard
Central Supply	Revenue statistics
Emergency	Patients per shift
Housekeeping	
Food Services	MoniTREND
I.V. Therapy	Historic performance
Laboratory	CAP
Laundry	Unidentified production records
O.B./Gyn.	Manpower analysis, nursing hours per patient day, staffing schedule, patient classification, attendance irregularities
O.R.	Patients per employee
Patient Accounts	Claims processed per person
Patient Services (Nursing)	Manpower analysis, position control, time attendance report
Pulmonary Services	RT standards
Radiology	DuPont Imaging MIS
Rehabilitation	Monthly income statements, manpower report
Surgical	Manpower analysis, nursing hours per patient day, staffing schedule, patient classification, attendance irregularities
SPP	Historic performance

Standard Data Systems Indicated in Question 5d

Department	Standard
Cardiac Cath Lab	MoniTREND
Pulmonary Services	RT standards

now get from MoniTREND and the Revenue Statistical Summary.

In trying to assess the current utility of PMS data, the respondents indicated their usage of PMS data with respect to the 5 subject categories in question 8 as follows:

	Category	Total Response	Single Responses	Multiple Response			
a.)	Staffing/ Scheduling	18		a,b	7	a,c	2
b.)	Budgeting	19		a,b,c	3	b,c	1
c.)	Cost containment	14	1	a,b,c,d	3	b,c,d	1
d.)	Work scheduling	7		a,b,c,e	2	b,d	1
e.)	Other (C)	3	1	a,b,d	1	c,d	1

(C) Other category consisted of: prepare cost per test statements
work assignments.
comparison to regional hospitals.

When asked in question 9 how PMS data might be used (given the same 5 categories as used in question 8) the following responses were obtained:

	Category	Total Response	Single Responses	Multiple Response			
a.)	Staffing/ Scheduling	18	2	a,b	2	a,c	2
b.)	Budgeting	14		a,b,c	7	a,d	1
c.)	Cost containment	14		a,b,c,d,e	1	b,c,d	1
d.)	Work scheduling	5		a,b,c,e	2	c,d	1
e.)	Other (D)	3		a,b,d	1		

(D) Other category consisted of: prepare cost per test statements
patient acuity level
clerical section productivity evaluation

In question 10, 21 respondents indicated that they personnally Monitrend productivity in their departments, 5 indicated they did not and 1 did not respond.

When asked to list problems which make productivity monitoring activities difficult, the responses noted in Table were obtained. The most frequent complaint was the lack of consistency caused by variations in case load. Poor feedback was noted in two cases which is interesting. And employee attendance and turn over got mentioned four times.

Table A5
Problems with Productivity Monitoring Question 11

Specific Problems of Those Responding 'YES' to Questions #10

Key	Nature of Problem
A.	Variation of case load affects consistency
B.	Lack of adequate clerical help
C.	Employee turnover and attendance problems
D.	Poor feedback hinders monitoring productivity
E.	No method exists to document some services being performed
F.	Work standards inaccurate or non-inclusive
G.	Excessive enforced idle - wait on other departments
H.	Excessive paperwork to schedule and to monitor
I.	Management/Supervision hinderances

Problem Key	Department	Problem Key	Department
A	Cardiac Cath. Lab	H	Medical Records
A	Central Supply	F	O.R.
A	Data Processing	A	Patient Accounts
*	Emergency	A,C	Patient Services (Nursing)
B	Enterostomal Therapy	C,I	Pulmonary Services
A,C	Housekeeping	A	Radiology
A,D	Food Services	E,F	Rehabilitation
E,F	I.V. Therapy	*	Social Services
D	Laboratory	A,C,F	Surgical
G	Laundry	H	S.P.P.
H	Maint./Engr.	*	Purchasing

* Responded 'YES' to question #10 but failed to respond to question #11

APPENDIX B

DEPARTMENT HEAD INTERVIEW SUMMARIES

In addition to the survey sent to all department heads, personal interviews were conducted by Nelson Sayford with representatives of the following departments: Radiology, Pulmonary Services, Laboratory, Surgery, Maintenance, and Dietary. While the original purpose of these interviews was to gain a deeper insight into the general status of productivity monitoring in these departments (and this did in fact occur) other, more general, insights were also gained. In fact, many of the meetings generated multiple management engineering follow-on project ideas some of which will be presented later. Most of these interviews lasted from 45 minutes to one hour and the highlights are summarized below, by department. Radiology will not be included here as activities in this area will be discussed in more detail in a later section.

B.1 Pulmonary Services

The meeting in Pulmonary Services was held with Barbara Rees and Phil Cataldo. Pulmonary Services does attempt to monitor the productivity of its personnel. Utilizing standard treatment times developed for Pulmonary Services (See end of Append. B),a monitoring system is currently in use in this department. At the conclusion of each shift, the therapists and technicians are required to complete a work sheet indicating all procedures done on that shift. These individual reports are periodically compiled by the shift supervisors and transmitted to the department head. A simple multiplication of the periodic treatment counts by the standard treatment times, should yield a representative standard workload against which actual performance could be evaluated.

In theory,this would work. In actual practice, however, there are some operational problems with this system. First, there does not seem to be a wide spread acceptance of the standards in use. The standards represent what, in a textbook context, should be done for the patient with respect to any given treatment, but do not necessarially reflect actual practice at Kennestone. Due to workload constraints, some treatments are being given faster than the standard treatments dictate, or in some cases perhaps less frequently than indicated by the standards. What this means is that no real standards will exist in Pulmonary Services until such time as a standard treatment can be agreed upon. Given that there are no detrimental effects to the patient of receiving the non-text-

book treatment, and given the seemingly wide-spread interest and concern relating to the effectiveness of pulmonary services treatments coupled with the fact that treatments are not all given in the same manner (due to lack of adequate time) standard setting would be most difficult in this department at this time. It would appear that the first step in this direction would be to reach some agreeable compromise on standard treatments which could then be studied to develop standard times. Such a developmental activity would require a meeting of the minds of medical staff, Pulmonary Services staff and administration.

When asked if improved standards would help with the operation of the department the general concensus seemed to be that this would not help with the scheduling of the department's staff at this time since it is over utilized (with some unfilled positions) and no real ability to react to optimal staffing levels currently exists. The department's response to "code" calls also must be factored in when scheduling decisions need to be made.

Other observations, not necessarially related to productivity monitoring, were that a daily activity summary of procedures billed and credited to patient accounts would be helpful for charge control purposes; and that study of the current charge structure would be helpful. The later suggested making the charges for some services with multiple patient contacts, such as oxygen administration/monitoring, or "code" call activities, more reflective of the actual time spent on these activities.

There would appear to be several areas for possible follow-on study in Pulmonary Services which will be presented later.

8.2 Laboratory

The laboratory meeting was actually a by product of the first attempt to reconcile manual procedure counts with those generated by the computer system. The laboratory currently uses the College of American Pathologist (CAP) work standards which are in general use around the country. The problems noted with productivity monitoring in the laboratory relate to the general hospital-wide problem of counting procedures on the computer system and to the charging of

technologist time to the appropriate division within the laboratory. Since there can be transfers of technologists from one work station to another during a shift, without an intricate time card and/or time control system it is difficult to relate the current time card data to a specific work count or productivity. In addition, since no daily time card data are generated, and since daily and shift wise staffing adjustments are required in the laboratory, a bi-weekly productivity monitoring system would be of marginal utility to the laboratory for staffing and scheduling purposes.

As with many departments, the counting of procedures in the laboratory does not directly relate to billed procedures but relates more to the functional counting system developed by CAP. Certain procedures billed as total procedures such as CBC may in fact be counted by CAP as two procedures (breaking the CBC into more elemental phases). This charge grouping is encountered in other areas and specific examples have been found in Radiology and the Rehabilitation Center. The problems generated by the charge groupings can be dealt with as will be discussed in more detail in the Radiology section. The more difficult challenge in the laboratory would seem to be the allocation of bi-weekly time card data to specific work divisions.

B.3 Surgery

Meeting with Hazel Kath, it was learned that the OR calculates a patient/employee ratio as a measure of productivity. This is accomplished by recording the number of procedures done, the FTE's worked, and the minutes of surgery performed. Since the scheduling of surgical procedures is a daily activity complicated by the introduction of emergencies, several suggestions for improving the scheduling process were advanced by Ms. Kath. Since these are only peripherally related to productivity monitoring, they will be presented later as suggestions for future studies.

B.4 Maintenance

Maurice Chapman has instituted several systems through which he can monitor the productivity of maintenance workers. Standard times are being developed for the more routine (mostly preventive maintenance) tasks and can be used to schedule PM workers. A job order follow-up stystem is in effect to facilitate the accuracy of the job-time estimates now being

provided by the supervisors. Records are kept to relate completion times to do job orders and those jobs not completed within the estimated time are analyzed. Due to the fluctuations of maintenance calls and the wide diversity of maintenance jobs, standard setting for all maintenance activities would be difficult. An additional complication is the fact that maintenance is not on the computer system and no record is currently kept on the computer of maintenance requests. This makes getting a work count to be used in an institute-wide PMS much more difficult.

B.5 Dietary

From Ms. Wall, it was learned that the dietary department keeps records on the following measures of productivity: meals served/FTE, raw food cost/meal, and total food cost/meal. Good records exist and a target of 49.3 meals/FTE/day has been established for the department. These are excellent indices, however, as with maintenance, not all work counts are in the computer making the establishment of a PMS more difficult.

STANDARDS OF PERFORMANCE

Pulmonary Services Department
Kennestone Hospital

January 21, 1981

Effective Date: January 26,1981

PURPOSE: To provide and maintain an excellence in patient care while keeping with established departmental and hospital policy and procedures. To provide a minimum standard for personnel evaluations.

1.0 Staff Coverage:
- A. Day and Evening shift - These shift are to be covered (staffed) by no less than one (1) Respiratory Therapist and three (3) Senior Technicians/Technicians.
- B. Night Shift - The shift will be covered (staffed) by no less than one (1) Respiratory Therapist and one (1) Technician.

2.0 Reporting for duty:
- A. Day shift begins at 6:30am (6.5/6.6) and ends at 3:00pm (15.0/15.2) (exception-Employees with children at child care center may report at 6.7/6.8 and leave at 15.2/15.4) this must be authorized by day shift supervisor.
- B. Evening shift begins at 2:30pm (14.5/14.6) and ends at 11:00pm (23.0/23.2)
- C. Night shift begins at 10:30pm (22.5/22.6) and ends at 7:00am (7.0/7.2)

All staff will report for duty in full uniform which is to include a stethascope, watch with second hand and name tag. A flashlight will be required for 11-7 shift only.

3.0 The staff responds to all CODES (cardiac/respiratory arrest) and/or emergencies within two (2) minutes and maintains a patent airway with or without mechanical ventilation until (A) the physician orders it to be discontinued or, (B) the physician orders a ventilator, or (C) gives other orders. Staff does not leave the patient until directed by the physician or his/her supervisor. EXCEPTION: Day and Evening shift-Two members of the staff, at discretion of the supervisor on duty, will remain until our services are no longer needed. Other personnel shall maintain patient care in the rest of the hospital.

4.0 The staff returns all STAT calls within thirty (30) seconds and deals with the situation according to orders. (Exceptions: i.e., a stat call for a room air humidifier does not take place in lieu of a patient treatment) All other pages or orders are responded to within three (3) minutes and delt with according to the situation.

5.0 Ventilators are to be checked per ventilator record every two (2) hours with proper documentation. If work loads are excessive three (3) written and one (1) visual check will be permitted.
- A. Day shift-8am, 10am, 12noon, 2pm
- B. Evening shift-4pm, 6pm, 8pm, 10pm
- C. Night Shift-12midnight, 2am, 4am, 6am

Standards of performance
Pulmonary Services Department
1/26/81

6.0 All patient treatments are to be completed with proper documentation in:
A. BLUE ink - Day shift
B. BLACK ink - Evening shift
C. RED ink - Night shift

This will include treatments, oxygen equipment and vaporizers. Treatments not given are to be recorded as per the DSPP.

7.0 Oxygen equipment will be rounded upon twice (2) per shift. With complete documentation on all patients McGaw humidifiers will be changed at less than 100cc's. On second rounds Bard-Parker bottles will be full, Concha systems and Cascade/ Ohio systems must be above the fill line. Ohio tents must be above the fill line and the reservoir bottle emptied. Vaporizers must be full on second rounds (7-3 and 3-11 shifts only).
A. Day shift rounds - 9:00am and 1:00pm.
B. Evening shift rounds - 5:30pm and 9:30 pm.
C. Night shift rounds - 1:30 am and 5:30 am.

8.0 All disposable oxygen equipment in active use will be changed out on Wednesday.
A. Day shift - 4th floor, 6th floor, emergency room and X-ray
B. Evening shift - 3rd floor, 5th floor, labor & delivery area and nursery
C. Night shift - shall be responsible for changing out all ventilator circuits on a daily basis.

9.0 The "E" oxygen cylinders are checked and changed if under 500 psi for nipple and key throughout the hospital to include those located on the second floor. Empty cylinders will be handled as follows:
A. Day shift - Bring empty cylinders to the department on Wednesday mornings.
B. Night shift - Take empty cylinders to the dock area in the early a.m. of Thursday
C. Evening shift - Bring the full cylinders up from the dock area and store them in their appropriate location on Thursday afternoons.

All emergency equipment (boxes) are to be check and documented as per DSPP.

10.0 The staff will hold and document an In-service program once per week.

11.0 The department will be cleaned and equipment stored to the satifaction of the oncoming supervisor by:
A. Day shift - 2:00pm B. Evening shift - 10:00pm C. Night shift - 6:30am

12.0 The depart documentation will be completed to the satisfactionof the oncoming supervisor by:
A. Day shift - 2:00pm B. Evening Shift - 10:00pm C. Night shift- 6:00am

13.0 The man hour budget is maintained by documenttion on the time cards.

Standards of Performance
Pulmonary Services Department
1/26/81

14.0 The overtime rate does not exceed 2% of the F.T.E.
- A. Days 12.0 hours
- B. Evenings 11.2 hours
- C. Nights 4.8 hours

15.0 Charts will be taged in accordance with the DSPP as follows:
- A. Days - The day shift supervisor or designate will write out tags and compile a list of the treatments to be tagged.
- B. Evenings - Evenining staff will place the tags found in the cardex onto the patients chart in its appropriate location, on their respective floors.
- C. Nights - Night staff will be responsible for the tagging of all PRN oxygen as per DSPP.

16.0 Everyone is expected to work the posted schedule. Changes will be made only with the approval of the supervisor.

17.0 Everyone is responsile for reading the memo book daily.

18.0 An outside continuing education program is to be attended by all staff members at least once a year; with or without hospital support.

19.0 You are expected to follow all departmental policies and procedures which includes implementing and following any changes in those policies and procedures.

_____
date Barbara A. Rees, R.R.T.
Director of Pulmonary Service

I have read and had explained to me the minimum performance standards of the Pulmonary Services Department contained in this document. I do not have any additions or deletions at this time. I understand that this is to be used as part of my performance evaluation (s).

_____
date signature

DAY OF _____ FOR PERIOD

DAY _____

DAILY SHIFT REPORT
Kennestone Hospital
PULMONARY SERVICE

DATE: _____

SHIFT: _____

STAFF	1	2	*3	4	5	*6	7	8	*9	10	11	*12	13	14	15	16	17	18	19	20	21	22	23	24	25
1																									
2																									
3																									
4																									
5																									
6																									
7																									
TOTAL PROCEDURES																									
FACTOR(1/10 HOUR)	X	.5	.25	X	.6	.3	X	.5	.25	X	.25	.08	1.5	2.0	.5	.04	.25	.1	.06	.3	.1	.15	.25	r	r
WEIGHTED UNIT	X			X			X			X															

1. NEBULIZER TXS ASSIGNED
2. NEBULIZER TXS NEW STARTS
* 3. NEBULIZER TXS COMPLETED(FROM ASSIGNED)
4. CPT and/or PD TXS ASSIGNED
5. CPT and/or PD TXS NEW STARTS
* 6. CPT and/or PD TXS COMPLETED(FROM ASSIGNED)
7. IPPB TXS ASSIGNED
8. IPPB TXS NEW STARTS
* 9. IPPB TXS COMPLETED(FROM ASSIGNED)
10. I.S. TXS ASSIGNED
11. I.S. TXS NEW STARTS
*12. I.S. TXS COMPLETED(FROM ASSIGNED)
13. VENTILATORS ASSIGNED
14. VENTILATORS INSTALLED
15. VENTILATORS D/CED
16. PATIENTS ON ROUTINE 02
17. ROUTINE 02 INSTALLED
18. ROUTINE 02 D/CED
19. PATIENTS ON HUMIDITY
20. HUMIDITY INSTALLED
21. HUMIDITY D/CED
22. VAPORIZERS CHECKED
23. VAPORIZERS INSTALLED
24. CODE OR EMERGENCY
25. _____

OXYGEN FLOORS ASSIGNED("B",2,3,4,5,6)

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

_____
SIGNATURE OF PERSON IN CHARGE OF SHIFT

* TREATMENTS NOT GIVEN MUST BE DOCUMENTED

	PATIENT	ROOM#	TX(S)	#	REASON	INITIALS
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

*STANDARDS MET(X = NOT MET WITH COMMENT(S) BELOW)

*1 2 3 4 5 6 7 8 9 10 11 12 13 14

*INSERVICE EDUCATION

*TOPIC _____ BY _____ TIME(S) _____

*PRESENT: 1) _____ 2) _____ 3) _____ 4) _____ 5) _____ 6) _____

*PRODUCTIVITY

*MAN-HOURS WORKED = _____ FTE = _____ BUDGET = _____ FTE = _____

*WEIGHTED UNITS = _____ FTE = _____ BUDGET = _____ FTE = _____

*OCCUPANCY @ SHIFT START = _____ PRODUCTIVITY = _____ %

COMMENTS:

MEMORANDUM

Barbara Rees, Director
Phil Cataldo, Assistant Director
TO: PULMONARY SERVICES

FROM:

RE: SHIFT REPORT(FY)
PERIOD ENDING.....

MAN-HOURS BUDGET = _____ FTE = _____
MAN-HOURS WORKED = _____ FTE = _____

I

PRODUCTIVE HOURS BUDGET = _____ FTE = _____
PRODUCTIVE HOURS ACTUAL = _____ FTE = _____

	DAY	HOURS	%PROD	OCCU		DAY	HOURS	%PROD	OCCU
WEEK I	S-1				WEEK II	S-8			
	M-2					M-9			
	T-3					T-10			
II	W-4					W-11			
	T-5					T-12			
	F-6					F-13			
	S-7					S-14			

ACTUAL PRODUCTIVITY FOR PERIOD = [redacted] %AVERAGE OCCUPANCY FOR PERIOD = [redacted]

TREATMENTS	ASSIGNED	NEW STARTS	COMPLETED	%
Hyperbaric				
Nebulizers				
CPT & PD				
II IPPB				
Inhalers				
TOTAL.....	[redacted]	[redacted]	[redacted]	

IV CODE OR EMERGENCY TIME = [redacted] HOURS/INSERVICE TIME = [redacted] HOURS

VENTILATOR DAYS _____
VENTILATOR INSTALLED _____
VENTILATOR D/C _____

NASAL O2 DAYS _____
NASAL O2 INSTALLED _____
NASAL O2 D/C _____

V

HUMIDITY DAYS _____
HUMIDITY INSTALLED _____
HUMIDITY D/C _____

TIME NOT CHARGED:
NSY _____ HOURS
ER OR RR _____ HOURS
RESP TIME _____ HOURS

TREATMENTS NOT GIVEN:

REASON	NUMBER
D/C or home	
No Time	
VI Refused	
Hold Per RN or MD	
Patient Unable	
S.O.C.B.S.	
PRN/W.A.	

VII VAPORIZERS:

Checked: _____
Installed: _____

APPENDIX C

DEPARTMENTAL STANDARDS IN USE

RADIOLOGY

COST ANALYSIS PROGRAM — STANDARD CONSTANTS TABLE I

EXAMINATION	% OF TOTAL EXAMS	FILM USED PER EXAM	SQ. FT. PER EXAM	MINUTES RT TIME IN DIAG. ROOM PER EXAM	PROC. CHEM & OPAQUE AS % OF FILM	MAINT. AS % OF FILM
CHEST	34.0	2 - 14x17	3.3	5	11.0	33.0
EXTREMITIES	22.0	2 - 10x12	1.7	10	11.0	33.0
SPINE-RIB	9.0	2 - 14x17	3.3	15	11.0	33.0
SKULL	7.0	5 - 10x12	4.1	15	11.0	33.0
GI	6.0	2 - 14x17	3.3	35	11.0	33.0
		3 - 10x12	2.5			
		4 - 8x10	2.2			
BE	5.0	4 - 14x17	6.6	35	11.0	33.0
		4 - 8x10	2.2			
KUB	4.0	1 - 14x17	1.7	8	11.0	33.0
IVP	4.0	7 - 14x17	11.6	35	48.0	33.0
GB	3.0	6 - 10x12	5.0	23	72.0	33.0
PELVIS-HIP	3.0	2 - 14x17	3.3	5	11.0	33.0
MISC SPECIALS	1.0	3 - 14x17	5.0	50	37.0	33.0
MAMMOGRAM	1.0	3 - 8x10	1.7	30	11.0	33.0
ANGIOGRAPHY	1.0	30 - 14x14	40.0	~~300~~ 80	42.0	33.0

E. I. DU PONT DE NEMOURS & CO. INC.
PHOTO PRODUCTS DEPARTMENT
X-RAY SALES DIVISION
03/23/81

DIAGNOSTIC RADIOLOGY DEPARTMENT COST ANALYSIS

INPUT DATA

PREPARED FOR:

[illegible] HOSPITAL
[illegible] GA 30060

DATA FOR PERIOD-01/80 TO 01/81

P O AYERS RT ADMIN TECH

ANNUAL DIAGNOSTIC EXAMS	67,396
FILM COST PER SQUARE FOOT	$1.125
NUMBER ON NON-TECHNICAL ROLL	18.3
$ NON-TECH PAYROLL INCLUDING BENEFITS	$200,090
NUMBER ON RT ROLL	22.5
$ RT PAYROLL INCLUDING BENEFITS	$364,530

RATIO ANALYSIS

EXAMINATIONS PER YEAR PER RT	2,995
EXAMINATIONS PER YEAR PER NON-TECH	3,683
AV. SALARY PLUS BENEFITS PER YEAR PER RT	$16,202
AV. SALARY PLUS BENEFITS PER YEAR PER NON-TECH	$10,934
EXAMS PER DIAGNOSTIC ROOM	7,488

B59-036
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F.LOPEP

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E. I. DU PONT DE NEMOURS & CO. INC.
PHOTO PRODUCTS DEPARTMENT
X-RAY SALES DIVISION
02/23/81

DIAGNOSTIC RADIOLOGY DEPARTMENT COST ANALYSIS

PREPARED FOR:

PINNACLE HOSPITAL
MARIETTA GA 30060

DATA FOR PERIOD-01/80 TO 01/81

P D AYERS RT ADMIN TECH

DEPARTMENT STANDARD COSTS

EXAMINATION	#/YR	$FILM /EXAM	$RT /EXAM DIRECT	$CHEM & OPAQUES /EXAM DIRECT	$TOT /EXAM DIRECT	$RT /EXAM DIST	$NON-T /EXAM DIST	$MAINT /EXAM DIST	$TOT /EXAM DEPT CONTROL	$TOT COST DEPT CONTROL
CHEST	22915	$3.71	$.68	$.41	$4.80	$1.02	$3.51	$1.22	$10.55	$241,753
EXTREMITIES	15501	$1.91	$1.35	$.21	$3.47	$2.03	$3.51	$.63	$9.64	$149,429
SPINE-FEB	6096	$3.71	$2.03	$.41	$6.15	$3.05	$3.51	$1.22	$13.93	$84,899
SKULL	4718	$4.61	$2.03	$.51	$7.15	$3.05	$3.51	$1.52	$15.23	$71,855
GI	3370	$9.00	$4.73	$.99	$14.72	$7.10	$3.51	$2.97	$28.30	$95,371
GE	2022	$9.90	$4.73	$1.09	$15.72	$7.10	$3.51	$3.27	$29.60	$59,851
GU	3370	$1.91	$1.08	$.21	$3.20	$1.62	$3.51	$.63	$8.96	$30,195
IVP	2696	$13.05	$4.73	$6.26	$24.04	$7.10	$3.51	$4.31	$38.96	$105,036
GB	2022	$5.63	$3.11	$4.05	$12.79	$4.67	$3.51	$1.86	$22.83	$46,162
PELVIS-HIP	2022	$3.71	$.68	$.41	$4.80	$1.02	$3.51	$1.22	$10.55	$21,332
MISC SPECIAL	1348	$5.63	$6.75	$2.08	$14.46	$10.13	$3.51	$1.86	$29.96	$40,386
MAMMOGRAM				NOT APPLICABLE FOR THIS STUDY						
ANGIOGRAPHY	1348	$45.00	$40.50	$18.90	$104.40	$60.75	$3.51	$14.85	$183.51	$247,371
TOTAL EXAMS	67396									
COST PER EXAM		$5.01	$2.55	$1.16	$8.72	$3.83	$3.51	$1.65	$17.71	
TOTAL ANNUAL COST		$337,654	$171,860	$78,179	$587,693	$257,790	$236,674	$111,203		$1,193,242

BCG-2F6
PHOTO PRODUCTS
P.LOPER

XDPP.VAR - PRT4535

E. I. DU PONT DE NEMOURS & CO. INC.
PHOTO PRODUCTS DEPARTMENT
X-RAY SALES DIVISION
02/23/81

DIAGNOSTIC RADIOLOGY DEPARTMENT COST ANALYSIS

PREPARED FOR:

KEYSTONE HOSPITAL
MARIETTA GA 30060

DATA FOR PERIOD-01/80 TO 01/81

P D AYERS RT ADMIN TECH

ANNUAL COSTS - SUPPLIED BY HOSPITAL

FILM EXPENDITURE	$360,222
PROCESSING CHEMISTRY EXPENDITURE	$20,022
CONTRAST MEDIA EXPENDITURE	$34,220
EXPENDITURE - OTHER SUPPLIES	$109,078
DEPRECIATION CHARGE - DIAGNOSTIC EQUIP.	$103,896
EQUIPMENT LEASES	$9,600
EQUIPMENT MAINTENANCE	$47,740
HOSPITAL OVERHEAD CHARGE	$76,630

HOSPITAL GENERAL INFORMATION

CATEGORY	GOVERNMENT
BED SIZE	470
NUMBER OF DIAGNOSTIC X-RAY ROOMS	9
NUMBER OF STUDENT TECHNOLOGISTS	14
RESIDENTS IN RADIOLOGY	0

67

RSQ-235
PHOTO PRODUCTS
P.LOPSE

XDPP.VAP - PPT-935

E. I. DU PONT DE NEMOURS & CO. INC.
PHOTO PRODUCTS DEPARTMENT
X-RAY SALES DIVISION
02/23/81

DIAGNOSTIC RADIOLOGY DEPARTMENT COST ANALYSIS

PREPARED FOR:

KENNESTONE HOSPITAL
MARIETTA GA 30060

DATA FOR PERIOD-01/80 TO 01/81

P D AYERS RT ADMIN TECH

DEPARTMENT ACTUAL COSTS

EXAMINATION	#/YR	$FILM /EXAM	$RT /EXAM DIRECT	$CHEM & OPAQUES /EXAM DIRECT	$TOT /EXAM DIRECT	$RT /EXAM DIST	$NON-T /EXAM DIST	$MAINT /EXAM DIST	$TOT /EXAM DEPT CONTROL	$TOT COST DEPT CONTROL
CHEST	22915	$4.18	$.68	$.28	$5.14	$.76	$2.97	$.52	$9.39	$215,171
EXTREMITIES	15501	$2.15	$1.35	$.15	$3.65	$1.52	$2.97	$.27	$8.41	$130,363
SPINE-RIB	6066	$4.13	$2.03	$.28	$6.49	$2.28	$2.97	$.52	$12.26	$74,369
PELVIS	4719	$5.19	$2.03	$.35	$7.57	$2.28	$2.97	$.65	$13.47	$63,551
GI	3370	$10.13	$4.73	$.69	$15.55	$5.32	$2.97	$1.29	$25.12	$84,654
BE	2002	$11.15	$4.73	$.76	$16.64	$5.32	$2.97	$1.40	$26.33	$53,239
GU	3370	$2.15	$1.08	$.15	$3.38	$1.21	$2.97	$.27	$7.83	$26,387
IVP	6596	$14.70	$4.73	$4.34	$23.77	$5.32	$2.97	$1.85	$33.91	$91,421
GB	2002	$6.34	$3.11	$2.81	$12.26	$3.50	$2.97	$.80	$19.53	$39,439
PELVICE-HIP	2002	$4.18	$.60	$.28	$5.14	$.76	$2.97	$.52	$9.39	$18,986
MISC SPECIAL	1348	$6.34	$6.75	$1.44	$14.53	$7.59	$2.97	$.80	$25.89	$34,899
MYELOGRAM				NOT APPLICABLE FOR THIS STUDY						
ANGIOGRAPHY	1348	$50.67	$40.50	$13.11	$104.28	$45.52	$2.97	$6.38	$159.15	$214,534
TOTAL EXAMS	67396									
COST /EXAM		$5.64	$2.55	$.80	$9.00	$2.86	$2.97	$.71	$15.54	
TOTAL ANNUAL COST		$380,202	$171,860	$54,242	$606,308	$192,678	$200,166	$47,740		$1,047,068

RSQ-206
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XOPP.VAR - PRT4535

E. I. DU PONT DE NEMOURS & CO. INC.
PHOTO PRODUCTS DEPARTMENT
X-RAY SALES DIVISION
02/23/81

DIAGNOSTIC RADIOLOGY DEPARTMENT COST ANALYSIS

PREPARED FOR:

KENNESTONE HOSPITAL
MARIETTA GA 30060

DATA FOR PERIOD-01/80 TO 01/81

P D AYERS RT ADMIN TECH

SPECIAL COMPUTER PROGRAM CONSTANTS

EXAMINATION	% OF TOTAL EXAMS	SQ. FT. OF FILM USED PER EXAM	MINUTES RT TIME IN DIAG. ROOM PER EXAM	PROC. CHEM & OPAQUE AS % OF FILM	MAINT. AS % OF FILM
CHEST	34.0	3.3	5	11.0	33.0
EXTREMITIES	23.0	1.7	10	11.0	33.0
SPINE-PIE	9.0	3.3	15	11.0	33.0
SKULL	7.0	4.1	15	11.0	33.0
GI	5.0	8.0	35	11.0	33.0
GU	3.0	8.8	35	11.0	33.0
HSG	5.0	1.7	8	11.0	33.0
IVP	4.0	11.6	35	48.0	33.0
GB	3.0	5.0	23	72.0	33.0
PELVIS-HIP	3.0	3.3	5	11.0	33.0
MISC SPECIAL	2.0	5.0	50	37.0	33.0
MAMMOGRAM	0.0	0.0	0	0.0	0.0
ANGIOGRAPHY	2.0	40.0	300	42.0	33.0

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XDFP.VAP - PRT4E33

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X-RAY SALES DIVISION
02/23/81

DIAGNOSTIC RADIOLOGY DEPARTMENT COST ANALYSIS

PREPARED FOR:

[illegible] HOSPITAL
MARIETTA GA 30060

DATA FOR PERIOD-01/80 TO 01/81

P D AYERS RT ADMIN TECH

TOTAL COSTS INCLUDING DISTRIBUTIVES

EXAMINATION	#/YR	$TOT /EXAM DEPT CONTROL	$OTHER SUPPL /EXAM	$EQUIP DEPR & LEASES /EXAM	$OVERHD /EXAM	$TOT /EXAM	$TOT COST
[illegible]	22915	$9.39	$1.92	$1.24	$.69	$13.24	$303,394
[illegible]	15501	$8.41	$1.92	$.64	$.81	$11.58	$179,501
[illegible]	6056	$10.26	$1.92	$1.24	$.89	$16.31	$98,936
[illegible]	4718	$13.47	$1.92	$1.54	$.98	$17.91	$84,499
[illegible]	3370	$25.12	$1.92	$3.01	$1.83	$31.88	$107,435
[illegible]	2002	$26.33	$1.92	$3.31	$1.92	$33.48	$67,696
[illegible]	3370	$7.83	$1.92	$.64	$.57	$10.96	$36,935
[illegible]	2696	$33.91	$1.92	$4.37	$2.48	$42.68	$115,065
[illegible]	2022	$19.53	$1.92	$1.88	$1.43	$24.76	$50,064
[illegible]	2002	$9.39	$1.92	$1.24	$.69	$13.24	$26,771
[illegible]	1348	$25.89	$1.92	$1.83	$1.99	$31.58	$42,569
[illegible]			NOT APPLICABLE FOR THIS STUDY				
[illegible]	1349	$159.15	$1.92	$15.04	$11.62	$187.73	$253,060
[illegible]	67396						
[illegible]			$1.92	$1.67	$1.14	$20.27	
TOTAL APPLIED COST		$1,047,068	$129,078	$112,696	$76,630		$1,365,930

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XDPP.VAR - PRT4535

E. I. DU PONT DE NEMOURS & CO. INC.
PHOTO PRODUCTS DEPARTMENT
X-RAY SALES DIVISION
02/23/81

DIAGNOSTIC RADIOLOGY DEPARTMENT COST ANALYSIS

PREPARED FOR:

KENNESTONE HOSPITAL
MARIETTA GA 30060

DATA FOR PERIOD-01/80 TO 01/81

P D AYERS RT ADMIN TECH

INPUT DATA FOR EACH COST CENTER

	C T SCAN	ULTRASOUND	NUCLEAR MEDICINE
# EXAMS / YEAR	3,450	2,654	3,756
$ SUPPLIES / YEAR	$30,650	$14,382	$34,478
# TECHNOLOGISTS INVOLVED	0.1	1.0	2.0
$ TECH PAYROLL INCLUDING BENEFITS	$43,772	$27,436	$49,106
# NON-TECH INVOLVED	.9	.8	.8
$ NON-TECH PAYROLL INCLUDING BENEFITS	$8,902	$8,902	$8,902
$ MAINTENANCE	$40,543	$4,940	$7,060
$ EQUIP DEPRECIATION & LEASE	$110,735	$11,832	$20,556
$ OVERHEAD	$7,250	$5,022	$3,017

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E. I. DU PONT DE NEMOURS & CO. INC.
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02/23/81

DIAGNOSTIC RADIOLOGY DEPARTMENT COST ANALYSIS

PREPARED FOR:

KENNESTONE HOSPITAL
MARIETTA GA 30060

DATA FOR PERIOD-01/80 TO 01/81

P D AYERS RT ADMIN TECH

TOTAL COSTS INCLUDING COST CENTERS

EXAMINATION	#/YR	$SUPP /EXAM	$RT /EXAM	$NON-TECH /EXAM	$MAINT /EXAM	$TOTAL /EXAM DEPT CONTROL	$TOTAL COST DEPT CONTROL	$EQUIP DEPR & LEASES /EXAM	$OVER-HEAD /EXAM	$TOTAL /EXAM	$TOTAL COST
DIAGNOSTIC X-RAY*	67396	(	P E F E R	T O	D E T A I L	S H E E T S			)	$20.27	$1,365,930
C T SCAN	3490	$8.84	$10.54	$0.55	$11.62	$35.55	$124,070	$32.32	$2.09	$69.96	$244,160
ULTRASOUND	2654	$5.42	$10.34	$3.35	$1.86	$20.97	$55,654	$4.46	$1.89	$27.32	$72,507
NUCLEAR MEDICINE	3756	$9.18	$13.07	$0.37	$1.88	$26.50	$99,534	$5.47	$2.13	$34.10	$128,080
TOTAL ANNUAL COST											$1,810,677

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Meaning of Column Headings Shown on the Computer Printout